CIA/PB 131632-31

UNCLASSIFIED- SOVIET BLOC INTERNATIONAL GEOPHYSICAL YEAR INFORMATION

SEPTEMBER 12 1958

(32)

PB 131632-31

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September 12, 1958

U. S. DEPARTMENT OF COMMERCE
Office of Technical Services
Washington 25, D. C.

Published Weekly from February 14, 1958, to January 2, 1959
Subscription Price $10.00 for the series

PLEASE NOTE

This report presents unevaluated information on Soviet Bloc International Geophysical Year activities selected from foreign-language publications as indicated in parentheses. It is published as an aid to United States Government research.

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I. GENERAL

Soviet Journal Carries Article by California Seismologist

An article in Russian, "Seismic Investigations of the Earth's Crust," by Prof Frank Press, director of the seismic laboratory, California Institute of Technology, appeared in the August issue of Priroda, a Soviet monthly popular science journal. (Priroda, No 8, Aug 58, pp 33-37)

II. ROCKETS AND ARTIFICIAL EARTH SATELLITES

Acceleration Studies Discussed by Soviet Space Researcher

Lt Col (Medical Service) V. Usachev, Candidate of Medical Science, discusses "Acceleration During Supersonic Flights" in an article appearing in Sovetskaya Aviatsiya.

Prolonged period of acceleration during flights faster than sound produces certain changes in the human organism. Inability of the human organism to withstand G-force even of comparatively low magnitude places a limit on the possibility of carrying out tactical air maneuvers.

Many scientists have attempted to find the reason why vision becomes impaired in flyers who travel in planes at high speed. A Russian expert in aviation medicine, N. M. Debrotvorskiy, evolved a theory that visual complications are connected with changes in circulation. Under certain conditions, when the centrifugal forces exceed the compensatory possibilities of the human organism, the blood flow in the brain becomes disturbed. This produces impairment of vision, and further increase in centrifugal forces may result in loss of consciousness.

Scientists confirmed recently that visual disturbances are due to irregular blood flow to the retina. Any disturbance in vision is a signal for the pilot to reduce speed.

The human organism is capable of withstanding adverse effects of acceleration. Protective mechanisms come into action as soon as the centrifugal forces appear and the vascular reflexes immediately begin to regulate the arterial pressure more effectively and to accomodate the activity of heart to new conditions. Blood pressure evens out and blood flow in the brain remains at sufficiently high level.

Muscle tension in the stomach and in the lower extremities, during acceleration hinder blood flow into the lower half of the body, thereby compensating to some degree any disturbance in circulation.

It has been proven that a period of combat training and various physical exercises help to improve blood circulation, to develop abdominal muscles, to strengthen the higher branches of the nervous system, and to improve flight habits. This helps the human organism to become more responsive to signals, thus limiting the adverse effects of G-forces. At present, fighter pilots wear anti-G suits which improve blood flow in the brain. Effectiveness of such a suit is reduced 50 percent if it does not fit well. Properly fitted anti-G suits and systematic flight training can help human organism rapidly to adapt itself to changing breathing conditions while in flight.

Preliminary training, conducted in an airplane cabin on earth, may prevent many other complications while in flight.

It has been determined from foreign literature that altitude-compensating suits also serve as anti-G suits. Transfer of pressure to the body in those suits takes place by means of stretching devices consisting of lateral cylindrical compartments. In addition, such a suit provides more uniform pressure. (Moscow, Sovetskaya Aviatsiya, 12 Jul 58)

III. UPPER ATMOSPHERE

The "Sun Service" in the Soviet Union

The multilateral observations of the Sun are one of the most important divisions of the investigations conducted under the IGY program. In the Soviet Union, the systematic registration of all observed solar phenomena is termed the "Sun Service." The activities of the service, particularly those conducted at Pulkovo at the Main Astronomical Observatory of the Academy of Sciences USSR, are described by M. S. Zverev, Corresponding Member of the Academy of Sciences USSR, the deputy director of the observatory.

In the work of the Soviet "Sun Service," about 20 observatories and special stations are engaged. In addition to the regular photographing of the Sun's surface (photosphere), measurements of the magnetic field of sunspots are made, and radio emissions of the Sun are examined. The solar corona (the Sun's outer atmosphere) is studied with the aid of a special coronagraph. The results of these observations are regularly published in the bulletin Solnechnyye Dannyye (Solar Data).

The Pulkovo observatory takes part in interesting investigations connected with the shifting of the Earth's poles. Even the small transposition of the poles on the Earth's surface or the corresponding motion of its axis of rotation has extremely complex reasons associated both with the internal structure and elastic properties of the Earth, as well as with certain phenomena arising on the surface of the Earth and in the atmosphere (seasonal movements of the air masses, etc.) The study of this phenomenon is conducted by precise measurements of the geographic latitude of a place which changes as a result of the movement of the poles. The knowledge of the regularity of the latitudinal shifting of a place is of great value, in particular for air and sea navigation.

To derive the full motion of the pole, it is necessary to conduct observation at different latitudes. Recently, the Leningrad Optico-mechanical Plant, on order of the Pulkovo Observatory, made a series of special instruments, among them a large zenith telescope. With the aid of this instrument, several Soviet observatories, including Pulkovo, conduct latitude determination under the IGY program.

Longitude determinations also enter into the IGY program. These are produced from a comparison of accurate time obtained from astronomical observations with the results of the reception of radio time signals. These extremely accurate measurements make it possible to investigate the irregularity of the Earth's rotation around its axis, to reveal the small mutual shifting of continents on the surface of the Earth, to determine the speed of radiowave propagation, etc.

A great achievement of the Pulkovo observatory, said Zverev, is the method of photoelectric observations of stars. This was developed for determining accurate time by Prof N. N. Pavlov and is being successfully used in several observatories in the USSR.

Soviet astronomical observatories, including Pulkovo, actively participated in visual [moon-watch] and photographic observations of artificial Earth satellites beginning in October 1957.

Photographic observations of the sputniks were made with wide angle cameras equipped with electromagnet-operated shutters and chronograph printers. These observations make it possible to study in detail the motions of satellites, to determine the density and degree of braking of the air at altitudes of more than 100 kilometers, to study the shape of the Earth, and to determine the distance between the most distant points on the Earth where satellite observations are conducted.

Soviet operations under the IGY program, said Zverev, are conducted in cooperation with many foreign scientific institutions. Astronomical observatories of the USSR maintain an especially close scientific communication on time service, latitude, and Sun service with the observatories of the People's Republic of China, Poland, Czechoslovakia, the German Democratic Republic, etc. (Moscow, Sovetskaya Aviatsiya, 10 Jun 58)

More details on solar observations at Pulkovo were given in an article which appeared in Nauka i Zhizn', a Soviet popular science journal, by V. P. Vyazanitsyn, Doctor of Physicomathematical Sciences, deputy director of the Division of Physics of the Sun.

The various layers of the Sun's atmosphere; the photosphere, chromosphere, and the corona; their physical nature, the rising and fading of their formations; the sunspots, flares, flocculi prominences, and eruptions, all of this is the object of investigations conducted by the workers of the Division of Physics of the Sun. Special equipment is used in this work. One of the basic observation instruments is the horizontal solar telescope, which, in two combinations, has focal lengths of 17 and 60 meters. Supplementing it is a powerful spectrograph with a focal length of 7 meters. The spectral study of the Sun is made with the aid of a Soviet high-quality diffraction grating, very large in size, which makes it possible to investigate the spectrum of the Sun with great resolving power and dispersion.

A whole series of valuable instruments for observations were constructed in the shops at Pulkovo. Among them, for example, is a new instrument for the automatic registration of weak magnetic fields on the Sun. In addition, a spectroheliograph of original design, developed by A. V. Merkulov of the Pulkovo observatory is being used for observations under the IGY program. With it, monochromatic photographs of the Sun in different spectral lines are obtained.

A significant achievement, says Vyazanitsyn, is the organization at Pulkovo of systematic observations of the solar corona. Not long ago, a coronagraph of new design was developed at the observatory by D. A. Prokofyev. The new instrument greatly reduces the scattering of rays within it. This makes it possible to conduct observations of the corona all year, even thorgh the observatory is located at an altitude of only 75 meters above sea level.

Interesting results have been obtained during recent years of solar granulation, the physical conditions arising also from ionization, the structure of the chromosphere, prominences, corona, spots, and faculae.

The most important work of the IGY program conducted at Pulkovo is the measurement of the magnetic field of sunspots and the whole field of the Sun. These observations are extremely difficult, and only a small number of observatories possess the necessary apparatus.

Solar observations under the IGY program are conducted mainly by Pulkovo's mountain station near Kislovodsk, which is engaged in the Sun Service. This observatory is equipped with a Belopol'skiy spectrograph, a spectroheliograph, coronagraph, a chromosphere telescope, a photoheliograph (an instrument for photographing the Sun's photosphere), and also a radiotelescope. The station is also engaged in collecting materials from other observatories and compiling a catalogue of solar activity on the basis of these materials.

The Commission for the Study of the Sun under the Astronomical Council, Academy of Sciences USSR, together with Pulkovo Observatory issues the bulletin Solnechnyye Dannyye (Solar Data) in which the latest information on the Sun is published. It also includes tables, charts, and other results of investigations.

The principal accomplishment of the mountain station is the organization of regular observations of the solar corona. It is one of the two corona centers in Europe.

The scientific investigations of the mountain station play an important role in forecasting different geophysical phenomena, for example, magnetic storms, the disruption of radio communication, and, later on, it will probably be of value also in forecasts of the weather and other climatological phenomena (droughts, etc.). (Nauka i Zhizn', No 6, Jun 58, pp 14-15)

Soviet-Designed Probe for Maintaining Stable Orientation of Satellite and Rocket Axis

The following is a complete translation of an article (submitted for publication on 22 August 1957), "Probe for Measuring Density and Temperature While Moving at Supersonic Speed in a Highly Rarefied Medium," by G. A. Leykin, Interdepartmental Commission for Interplanetary Travel Under the Astronomical Council, Academy of Sciences USSR.

"In the case of an oriented body moving at supersonic speed in a highly rarefied medium, a probe of comparatively simple design seems possible. In this case, it is possible to make use of the fact that the thermal velocities of the particles of the medium, although their speed is much less in relation to the body, are still high and cause erosion of the corpuscular umbra. The higher the ambient temperature, the greater the erosion.

"The simplest probe of this type can be made in the form of a tube aligned parallel to the velocity of the body and covered on its leading end by a diaphragm, the opening of which is small in comparison with the free run length in the medium. The distribution of molecules flying in the tube, according to the tube's cross section, will be determined by the thermal velocity of the molecules, although their path does not exceed the free run length. At this same time, the total flow of molecules entering the tube is determined by the density of the medium and the velocity of the body. The medium must be so rarefied that a shock wave will not form in front of the body. The effect of the shock wave also can be eliminated by extending the intake opening of the tube beyond the fairing.

"Let a grid of thermoelements or other energy collectors (it is essential that the total area of the elements be much less than the cross section of the tube, otherwise a special apparatus ensuring the exhaustion of gas from the tube is necessary) be placed in the tube at a distance $\ell < \lambda$ (λ is the length of the free run), and let the velocity of the motion of the body V_0 be much more than the mean thermal velocity of the motion of the molecules. Flying the distance ℓ for the time ℓ/V_0, a molecule, near which the component of heat velocity perpendicular to V_0, is v, will move away from the tube's axis by a distance

$$r = \frac{\ell}{V_0} v$$

Having aligned the axis z parallel to the velocity of the body, we can write the Maxwell distribution in the form

$$dN(v) = N\left(\frac{m}{2\pi kT}\right)^{3/2} \exp\left[-\frac{m(v_x^2+v_y^2)+v^2}{2kT}\right] dv_x dv_y dv_z.$$

Integrating according to v_z and considering that $v^2 = v_x^2 \; v_y^2$, we obtain

$$dN(r) = N\frac{m}{2\pi kT} \exp\left[-\frac{m}{2kT}\left(\frac{V_0}{\ell}r\right)^2\right]\left(\frac{V_0}{\ell}\right)^2 dx\,dy.$$

"Omitting the thermal velocity in comparison with the velocity of the motion of the body, we obtain the flow of energy per unit area of the tube's cross section:

$$\mathcal{E}(r) = \frac{\sigma n_0 m V_0^3}{4}\,\frac{m}{2\pi kT}\exp\left[-\frac{m}{2kT}\left(\frac{V_0}{\ell}r\right)^2\right]\left(\frac{V_0}{\ell}\right)^2,$$

where σ is the area of the diaphragm opening, n_0 is the number of molecules in 1 cm^3 of the total medium. Measuring the relation of the energy at different distances from the axis of symmetry, it is possible to obtain an estimate of the kinetic temperature of the molecules of the medium. Actually

$$\ln\frac{\mathcal{E}(r_1)}{\mathcal{E}(r_2)} = -\frac{m}{2kT}\left(\frac{V_0}{\ell}\right)^2\left\{r_1^2 - r_2^2\right\}$$

or

$$T = \frac{m}{2k}\left(\frac{V_0}{\ell}\right)^2\frac{r_2^2 - r_1^2}{\ln\mathcal{E}(r_1) - \ln\mathcal{E}(r_2)}$$

"For a multicomponent gas the formulas are somewhat more complex. According to the known temperature, the velocity of the body and the mass of molecules, the density can be determined.

"With $\sigma = 1 \text{ cm}^2$, $n_0 = 10^8$ particles/cm^3, $m = 2.7 \times 10^{-23}$ grams (atomic oxygen), $V_0 = 8 \times 10^5$ centimeters/second, $T = 1{,}000$ degrees Kelvin, $\frac{V_0}{l} \approx 10^5$ seconds^{-1} ($l \approx 10$ centimeters) the energy flow for 1 cm^2/sec is of an order of magnitude of several ergs. Since the energy flow from stars of zero magnitude, consisting of approximately 10^{-5} erg/cm^2sec, is studied in astronomical practice with the aid of a bolometer or thermoelement attached to a telescope having an aperture ~ 1 meter and a sensing element with a diameter of ~ 0.1 cm, it is possible to expect that the energy flow in the sonde will give a measurement.

"If the molecules of the medium are disassociated and recombination occurs on the grid of the sensitive elements the energy discharge is considerably increased. The method of calculating the temperature in this case remains as before, inasmuch as the ratio of the energy discharge at equal distances from the axis is not changed.

"If the medium is strongly ionized, then the ambipolar diffusion, leading to still further erosion, must be considered in the calculation. The discharge of energy at the same time also strongly increases as a result of recombination on the grid of the receiver. The excess negative charge from the walls can, without especial difficulty, be drawn off by the outer walls of the body.

"The proposed probe can also be used as an instrument for following the orientation of a moving body in space: the shifting of the intensity maximum from the axis of symmetry signals the declination of the direction of the tube's axis from the direction of velocity of the body. Such deviation of the maximum probably can be used for maintaining a stable orientation of the axis of the body." (Izvestiya Akademii Nauk SSSR, Seriya Geofizicheskaya, No 4, Apr 58, pp 54-55)

New Telescope in Crimea Will Rank With World's Largest

According to an article by O. Karyshev which appeared in the newspaper Sovetskiy Flot, one of the largest telescopes in the world will be installed in the Crimean Astrophysical Observatory. It is now being constructed in the enterprises of the Leningrad Sovnarkhoz according to a design developed by a collective of specialists under the supervision of B. K. Ioannisiani, chief designer and Lenin Prize winner.

The weight of the telescope is in excess of 100 tons. One of its moving parts alone, together with a 10 meter tube some 3 meters in diameter, weighs 70 tons. A complex automatic device guarantees only the precise circular motion of the tube, which, on being aimed at any star, can persistently follow it.

The casting of its 2.6 meter diameter mirror presented great difficulty. The creation of a special grinding-polishing machine for finishing its surface was necessary.

A large tower, equal in height to a 20-story building for housing the instrument is now being built on the site of the observatory. This structure was designed by D. Kh. Yenikeyev.

The interior of the tower will be maintained at a constant temperature, necessary for ensuring the precise operation of many instruments.

The Presidium of the Academy of Sciences USSR resolved to bestow the name of Academician G. A. Shayn, an outstanding Soviet scientist in the field of astrophysics, on the new telescope. (Moscow, Sovetskiy Flot, 22 Jun 58)

Aurora Displays of 11 February 1958

Bright displays of aurora which extended far to the south were observed over territory of the Soviet Union on the night of 10-11 February 1958. The southern most point at which the aurora was viewed was at the city of Genichesk (46°N).

This aurora, which was preceded by the passage of a large group of sunspots across the central meridian of the sun, was accompanied by strong magnetic storms which encompassed the entire Earth. According to L. V. Lukina, Candidate of Physicomathematical Sciences of the Scientific Research Institute of Terrestrial Magnetism, Ionosphere and Radiowave Propagation (Moscow), the normal state of the F_2 layer was disrupted and the sporadic layer E_s was sharply defined at an altitude of 60 km.

The aurora was very intense and in many places extended from the horizon to the zenith. It was observed by G. Zaletayev, a teacher at Porech' Middle School; O. Semenov-Tyan-Shanskiy, Candidate of Biological Sciences and deputy director of the Pechoro-Ilychskiy State Preserve; I. Tverdov, P. Mitikov, and other members of the "Rybak" kolkhoz of the Kulyeyskiy Supply Center, Pechorskiy Rayon, Pskovskaya Oblast; V. Kuryshev from Ryazan'; seventh grade students from Vereshchagino, Permskaya Oblast; N. Kreshkov from Ryazanskaya Oblast; and many others. (Moscow, Priroda, No 8, Aug 58, pp 117-118)

IV. METEOROLOGY

Changes in the Electrical Conductivity of Air

The role of certain meteorological and electrical factors in the variation of the electrical conductivity of the air near the surface of the Earth are evaluated on the basis of experimental data by N. V. Krasnogorskaya, Institute of Applied Geophysics, Academy of Sciences USSR.

Krasnogorskaya presents the results of measurements of the conductivity of the air on Mt Elbrus for cloudless, cloudy, and rainy days in a Soviet periodical article, "Variation of the Electrical Conductivity of Air in Different Meteorological Conditions."

It is determined that with large values of the potential gradient of the electrical field, the conductivity of the air near the surface of the Earth changes, regardless of weather conditions, while the growth of the absolute value of the electrical field is accompanied by a sharp decrease in the density of ions which are the opposite of the sign of the vertical component of the potential gradient of the electrical field.

Some practical applications of these experimental results are given.

The conductivity of the air in stratocumulus clouds is considerably decreased at the expense of the interaction of cloud droplets both with positive as well as with negative ions. The principal adsorption of negative ions by the cloud droplets in stratocumulus clouds is absent near the surface of the Earth. (Izvestiya Akademii Nauk SSSR, Seriya Geofizicheskaya, No 4, Apr 58, pp 527-535)

V. OCEANOGRAPHY

Arctic Institute Completes Oceanological Studies in Greenland Sea

The newspaper Sovetskiy Flot reports the return of members of the High Latitude Expedition of the Arctic Institute to Leningrad after having carried out oceanological investigations in the Greenland Sea on board the research ship Toros.

The expedition conducted operations in the northern and central parts of the Greenland Sea, studying the problems of water and heat exchange in the Arctic Basin. The appearance of seasonal changes and annual variations in this exchange is important for the composition of ice prognoses and ship handling on the path of the northern sea route.

The trip of the Toros was made under favorable conditions. The ship crossed the 80th parallel, traveling a total of 3,500 miles. Measurements of the sea depths were made, and water samples were taken from the different layers of the water.

At the end of July, the expedition of the Arctic Institute planned to depart on a new voyage aboard the Toros to conduct oceanological investigations in the Karsk Sea. (Moscow, Sovetskiy Flot, 11 Jul 58)

VI. ARCTIC AND ANTARCTIC

New Information on the Origin of Floating Ice Islands

The origin of floating ice islands continues to be one of the most interesting mysteries of the Arctic. Scientists have expressed different opinions on this subject. Originally, the most widespread hypothesis was the one concerning the glacial origin of such islands. However, it was later established that present conditions in the Arctic do not warrant the formation of icebergs of such large dimensions as are characteristic for floating islands. As new data are collected, scientists are more and more inclined to assume that the ice islands represent large fragments of shelf ice, formed on the continental shelf near the northern coast of Ellesmere Land and Greenland, which has the appearance of old fast ice [sikossak ice].

The ice floe on which the drift station Severnyy Polyus-6 was organized in 1956, represents a typical ice island, both in size and external features. The study of this island makes it possible to obtain more precise data on the origin of floating ice islands.

The ice island of Severnyy Polyus-6 has the form of a triangle with rounded elevations. Its total area equals about 82 square kilometers, including 16 square kilometers of old "fast ice," which forms a whole with the island. The ice is from 6.5 to 12.5 meters thick; its average thickness, according to data of 11 measurements, is 10.3 meters. The transition from the main ice of the island to the adjoining ice pack, i.e., "fast ice," is gradual and hardly noticeable. The old pack ice, which is up to 4 meters thick, is, in turn, adjoined by young ice with a tendency to form hummocks, as a result of which the island is bordered on all sides by several belts of hummock ridges. The individual hummocks reach a height of approximately 8 meters; their average height is 4-5 meters. These hummocks, when seen from the air, often create the erroneous impression that the edge of the island is very high above the sea level. Therefore, it is still being claimed occasionally that the edges of the islands are elevated 10-15 meters above the sea. In that case, the islands would have to have a thickness of not less than 90-135 meters; however, this has not been confirmed by available data on some of the largest islands.

For example, the elevation of the ice above sea level on the island T-3 in July was 3.32 to 6.95 meters, or an average of 4.93 meters out of six measurements.

It is a known fact that the height of the above-water part of an ice floe is related to its total height at the rate of 1:9. Consequently, the thickness of the ice should be 45 meters, which corresponds to the US data on the average thickness of the island T-3. The snow cover has a marked effect on the proportion of the above-water part to the total thickness of the island ice. In April, for instance, when the island of Severnyy Polyus-6 was covered with snow, the ratio was 1:11, while in the absence of snow, the proportion was 1:9, i.e., the same as on the island T-3 during July.

The surface of the Severnyy Polyus-6 island is slightly undular, with alternating ridges and valleys through which the melt water runs into the ocean during the summer. In this process, the water hollows out shallow river beds, about 20-50 meters wide; in the winter, they freeze and are completely covered with snow so that they become almost undistinguishable from the total, relatively smooth surface of the snow. In some places, the small river beds form lakes, reaching a length of 500-800 meters or more; in some of the deeper portions of the lakes, the water does not freeze all the way to the bottom during the whole winter.

The folds in the island surface, as a rule, are parallel to one another, analogical to the undulation of the shore ice at the northern shores of Ellesmere Land.

The causes of the formation of undulation are closely related to the problem of the origin of ice islands. Supporters of the theory of the glacial origin of these islands assume that the surface of a glacier, in gliding down toward the sea, was deformed into folds, running perpendicular to the direction of the glacier movement. On the other hand, supporters of the shelf ice theory of the origin of ice islands indicate the possibility of the formation of ridges as a result of pressure on the old fast ice in the open sea in a direction perpendicular to the coastline. There are also theories regarding the formation of undulation of fast ice as a result of great fluctuations in the ice temperature.

The formation of the undulating surface of drifting ice fields can be observed in the Central Arctic Basin in the process of hummocking, when the impact of the adjacent ice floes on a given ice field is not sufficiently strong to break the bent ice. The ridges formed in this manner on the surface of the ice field are usually preserved for a long time.

In the Arctic, such pressure ridges can often be observed on drifting ice fields which are over one meter thick. The study of surface contours of such fields, and later of the contours of the Severnyy Polyus-6 island made it possible to discover the relation between the distances from ridge to ridge and the thickness of the ice. The thicker the ice at the time of formation of pressure ridges, the greater the distances between ridges. This is explained by the fact that when the ice is thicker, the length of the ridge of ice bending, when compressed by forces active in its plane, is considerably greater than in the case of an ice floe of lesser thickness.

According to estimates, the distance between ridges should equal 570 meters when the ice has an average thickness of 10 meters. Actually, the measured average distance between ridges on an area of the Severnyy Polyus-6 island of corresponding ice thickness equaled about 520 meters, which is very close to the estimate. However, the question of the formation of undulation cannot be considered as completely solved. It is not impossible that the formation of the surface contour of old fast ice, and consequently of ice islands, is greatly influenced by the irregular snow deposits, leading to an irregular thawing of ice during the summer.

Unexpected results have been obtained in the study of the chemical composition, structure, temperature, and strength of the ice of the Severnyy Polyus-6 island, conducted during April-May 1957.

Analyses of ice samples have shown that the salinity of the upper layers of the island is 0.5 to 2.3 percent; of the middle layers, from 3 to 5 percent; and of the lower layers, up to 7 percent. The average salinity of the ice on the Severnyy Polyus-6 island in April amounted to 3.67 percent, which was higher than the salinity of the one-year ice (1.15 percent in July), and also higher than the average salinity of old ice with a thickness of 3 meters (2.3 percent). It is interesting to note that the average salinity of the upper 3-meter layer of the island (2.4 percent) is very close to the salinity of old ice of equal thickness (2.3 percent).

These data make it possible to draw the conclusion that the Severnyy Polyus-6 ice floe has a marine origin, i.e., it was formed as a result of the accretion from below of old fast ice. Only this explains the presence of salts in the entire ice layer of the island; the salinity of the island could not be explained by the overwash of sea water on the ice floe, since core samples were taken from several drill holes at great distances from the island shore.

According to readings of the manometer on the drill spindle, the forces of resistance of the ice to cutting change according to depth in the same manner as in the case of drifting sea ice and fast ice. Thus, the upper layer of the ice floe with a thickness of 15 centimeters, which had disintegrated into crystals during the preceding summer, offered almost no resistance to the drill. Up to a depth of 4-5 meters the ice has the greatest strength. Below that level, the strength of the ice diminishes gradually in accordance with the changes in its salinity and temperature.

[A chart shows the distribution of temperature in the ice of Severnyy Polyus-6 island and of the Severnyy Polyus-4 ice floe, illustrating the similarity of their temperature regime.]

A study of the ice samples taken at considerable depths from the surface shows that the ice of the Severnyy Polyus-6 island, at the top and down to the lower levels, has a clearly defined vertical orientation of optic axes of crystals, similar to the crystalline structure of old and young sea ice accreted by a natural freezing process. This, of course, does not exclude the possibility that floating ice islands may contain some inclusions in the form of glacier fragments which have different properties and structure.

The greatest ice thickness of the Severnyy Polyus-6 island is 12.5 meters. This does not contradict the estimates made according to formulas on the accretion of sea ice, taking into account the immobile condition of the fast ice during a period of many years.

The floating ice islands are essentially different from regular drifting sea ice by the fact that silt particles and even individual small fragments of weathered rock are found on their surface. These foreign substances may have been on the ice before the island was separated from the shore ice, or they may have been carried over by the wind, or by melt water from the shore.

Thus, the Severnyy Polyus-6 island, as, apparently, several other floating ice islands in the Arctic, represents an ice field of marine origin, formed by many years' accretion of fast ice from below. Subsequently, the large field-island was torn loose from the old fast ice and is drifting together with the whole mass of Arctic ice. -- M. I. Ivanov, Candidate of Technical Sciences, drift station Severnyy Polyus-6. (Moscow, Priroda, No 7, Jul 58, pp 94-97)

Lowest Temperature Recorded in Antarctic

The history of meteorological science has never before encountered such climatic phenomena as are now being observed by members of the Third Antarctic Expedition of the Academy of Sciences USSR. Staff members of the interior stations Vostok and Sovetskaya recorded extremely low temperatures of the air, i.e., as low as minus 83 degrees Centigrade, during June and July. However, even these record temperatures have been exceeded since then.

The air temperature has continued to drop in the area of the interior antarctic stations. During the night of 7 August, meteologist P. Mitin recorded a temperature of minus 85.5 degrees Centigrade at the station Vostok; on 8 August, V. Babarykin, chief of station Sovetskaya, registered a temperature of minus 86 degrees Centigrade and on 9 August, minus 86.7 degrees Centigrade.

The unprecedented frost at the interior Antarctic stations during the first 10 days of August coincided with clear, calm weather over the entire Antarctic plateau. On the days with extremely low temperatures, all outdoors work is reduced to a minimum or stopped entirely. Only the meteorologists and aerologists are on duty. At Sovetskaya, aerologist V. Babarykin and radiosonde engineer G. Mayevskiy launch radiosondes regularly every morning. They have discovered some interesting phenomena, including the fact that the air temperature, when extremely low directly above the ground, gradually rises with increasing height. For example, on 8 August, the air temperature at a level of 2 meters above the ground was minus 83 degrees Centigrade, and at a height of 4,720 meters, the temperature had risen by 30 degrees. However, at very high altitudes, the temperature again diminishes. Thus, at an altitude of 17,300 meters, the same radiosonde registered minus 91 degrees Centigrade.

These observations will permit Soviet scientists to gain more comprehensive knowledge on the climatic peculiarities and the atmospheric circulation of the Antarctic continent. (Moscow, Vodnyy Transport, 19 Aug 58)

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Approved For Release 1999/09/08 : CIA-RDP82-00141R000200320001-7